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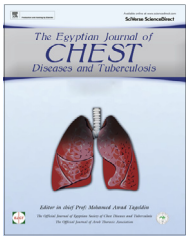

ORIGINAL ARTICLE

Value of thoracoscopic pleural brush in the diagnosis of exudative pleural effusion

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KEYWORDS

Thoracoscope;
Pleural effusion;
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Abstract *Background:* Nowadays, medical thoracoscope had been established to have greater diagnostic yield in the diagnosis of exudative pleural effusion. Forceps biopsy and pleural brush could be used through medical thoracoscope to obtain pleural cytopathological specimens, however the most popular used one was the forceps biopsy.

Aim of this study: To evaluate the value of thoracoscopic pleural brush in the diagnosis of exudative pleural effusion.

Study design: Interventional prospective study.

Setting: Endoscopy Unit, Chest Department, Assiut University Hospital, Egypt.

Material and methods: The study was conducted upon 28 patients with exudative pleural effusion from January 2011 to December 2011, in whom both the conventional pleural tapping and closed pleural biopsy were not conclusive. All patients submitted for medical thoracoscope, where forceps biopsy and pleural brush specimens were taken for all patients.

Results: Thoracoscopic pleural specimens were diagnostic in 26 patients out of 28 ones (92.9%). Histopathological examination of thoracoscopic specimens revealed malignant lesions in (20 patients), TB in (two patients) and non specific inflammation in (four patients). Forceps biopsy was positive in 22 patients, while pleural brush was positive in 17 patients. Thoracoscopic pleural brush was the only diagnostic modality in four patients all were adenocarcinoma. The lesions were mostly on the visceral pleura in one patient in whom visceral pleural brush was taken, while bleeding occurred with forceps biopsy in the other three patient. No complications recorded with pleural brush procedures.

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Conclusion: Thoracoscopic pleural brushing could be done easily and safely and allows obtaining pleural cellular material in areas dangerous to take biopsy specimens. It could augment the diagnostic yield of medical thoracoscope.

Introduction

Medical thoracoscopy has received renewed interest among pulmonary physicians in the recent past because of better instrumentation and simpler sedation protocols. With current techniques, medical thoracoscopy can be done as a day-care procedure under conscious sedation by pulmonary physicians. Medical thoracoscopy is a minimally invasive procedure done in spontaneously breathing patient, unlike video-assisted thoracoscopic surgery (VATS) which is conducted under general anesthesia with single lung ventilation [1]. It allows one to visualize the entire pleural surface and perform limited diagnostic and therapeutic procedures. The major indication for medical thoracoscopy is evaluation of exudative pleural effusions which remain undiagnosed after pleural fluid analysis and closed pleural biopsy. With thoracoscopy, one can visualize the entire visceral and parietal pleura and take pleural biopsy from suspicious sites under vision. Larger pleural biopsy specimen taken under direct vision allows greater diagnostic yield up to 90% [2].

The yield of thoracoscopic pleural biopsy is higher in patients with suspected pleural malignancy. A diagnosis could be achieved in 95% of patients as against 44% patients using closed pleural biopsy [3]. Forceps biopsy is the commonest used instrument to obtain thoracoscopic specimens from suspected pleural lesions; however its procedures may be associated with bleeding that hinder further biopsy, additionally the decision to take biopsy could be difficult specially when the targeted lesions were on the visceral pleura or near vascular structure. On the other hand pleural brush could be used to obtain pleural specimens through the medical thoracoscopy from suspected areas either in parietal or visceral pleura safely.

Materials and methods

Patients

Interventional prospective study was conducted upon 28 consecutive patients during the period from January 2011 to December 2011. All the recruited patients had documented exudative pleural effusion in whom the initial pleural tapping and closed pleural biopsy (CPB) were not conclusive. CPB was not conclusive if it was either absence of pleural tissue, normal pleural tissue or non-specific inflammation with strong clinical and radiological data suggestive for alternative pathological diagnosis. All patients underwent medical thoracoscopy in our endoscopy unite. Chest ultrasonography and computed tomography (CT) of the chest were performed to assess feasibility of thoracoscopy. Patients with excess rib crowding with narrow inter-costal space and loculated pleural effusion could not undergo thoracoscopy. Also patients with bleeding diathesis, hemodynamic instability, arrhythmias and intractable cough could not eligible to do thoracoscopy.

Procedure

The medical thoracoscopy was done with complete aseptic precaution under local anesthesia, conscious sedation and potent analgesia. The procedures were performed through a single-puncture technique [4] using semirigid thoracoscope (LTF; Olympus; Tokyo, Japan). Patients were placed in the lateral decubitus position with the affected side upward. The patient's blood pressure, pulse rate, and oxygen saturation were monitored continuously. Supplemental oxygen was given to the patients to maintain oxygen saturation. Lidocaine 2% 10–20 ml was used for local anesthesia. Conscious sedation was achieved with intravenous midazolam (0.5 mg/kg body weight) and intravenous tramadol 5 mg was given for analgesia prior to the start of procedure. Moreover pethidine (meperidine hydrochloride) 25 mg as IM injection could be given to control pain if analgesia could not be achieved with tramadol during the procedure. After local anesthesia was placed, a small skin incision was made in the mid-axillary line either in the fifth or sixth inter-costal space. The skin incision is followed by introduction of a 10-mm blunt trocar with a cannula into the thoracic cavity. After the trocar was removed, all fluid was suctioned, and then thoracoscope was introduced into the pleural cavity, where the parietal and visceral pleura were successively inspected. Pleural brush was used first followed by forceps biopsy to obtain pleural specimens from suspect areas under visual control. The procedure was followed by the placement of a 24F standard chest tube. A chest radiograph was obtained post procedure. The histopathological results were noted. Major and minor complications were routinely recorded. Major complications were retrospectively defined as events requiring active medical management during the hospital stay, according to Colt [5]. Minor complications were events requiring medical supervision only.

Results

During a period of 12 months from January 2011 to December 2011, 28 patients underwent medical thoracoscope in our endoscopy unit for the purpose to reach final diagnosis for undiagnosed exudative pleural effusion. The characteristics of these patients are summarized in Table 1. The median age of patients was 53 years with range (22–62 years), 21 males and 7 females. All males were current smokers with median tobacco index equal 25 pack-years. The average duration of the procedure was 21.4 min (15–25 min). Visualization of the pleural space was difficult in two patients due to thick adhesions while thin adhesions seen in four patients that could be taken down by forceps biopsy. Most of the detected lesions were nodules over the diaphragmatic and costal parts of the parietal pleura. Whitish patches revealed in two patients, whitish lymphedema in six patients, anthracotic patches in four patients and nodules over the visceral pleura in 5 cases (Table 2). The pathological examination of the pleural specimens ob-

Table 1 Characteristics of 28 patients with undiagnosed exudative pleural effusion.

Characteristics	Results
Age in years (median)	53 years
Gender	
Male (number)	21
Female (number)	7
Smoking index/median (pack-year)	25
Side of effusion	
Right	19
Left	6
Bilateral	3
Average duration of procedure (min)	21

Table 2 Thoracoscopic pleural findings in 28 patients managed by medical thoracoscope.

Findings	Number of patients
Nodules over parietal pleura	15
Nodules over visceral pleura	5
Thin adhesions	4
Thick adhesions	2
Anthracotic patches	4
Whitish patches	2
Whitish lymphedema	6

Table 3 The detailed microscopic findings of the pleural specimens obtained by the thoracoscopic forceps and brush.

Microscopic findings	Forceps		Brush	
	Number	%	Number	%
Pathology detected	22	78.6	17	60.7
Adenocancinoma	11	39.3	13	46.5
Mesothelioma	3	10.8	0	0
Small cell lung cancer	1	3.6	0	0
Non-Hodgkin lymphoma	1	3.6	0	0
Tuberculosis	2	7.1	0	0
Non-specific pleuritis	4	14.2	4	14.2
Pathology not detected	6	21.4	11	39.3

tained by the thoracoscopic pleural brushing revealed adenocarcinoma in 13 patients and non-specific inflammation in 4 cases. In the remaining 11 cases, the specimens were not conclusive and no pathology detected. On the other hand, the specimens obtained by the forceps from the same patients showed adenocarcinoma in 11 patients, malignant mesothelioma in three patients, small cell lung cancer in one patient, non-Hodgkin lymphoma in one patient, tuberculosis in two patients, and non-specific pleuritis in 4 cases. In the remaining 6 cases, no pathology recorded. Collectively, the pleural brush showed pathology in 17 out of 28 cases (60.7%) while pleural biopsy forceps showed pathology in 22 out of 28 patients (78.6%) (Table 3). Considering the results obtained by both forceps and brush in the same patient, the net microscopic findings of the thoracoscopic pleural specimens will be neoplastic pathology in 20 out of 28 cases (71.4%), non neoplastic lesion in 6 out of 28 cases (21.4%) and no pathology in 2 out of 28 cases (7.2%) (Fig. 1). Collectively, the thoracoscopic pleural specimens showed pathology in 26 out of 28 patients (92.9%); the final detailed microscopic findings of them are illustrated in Table 4.

Among these 26 cases, forceps biopsy was the only diagnostic modality in 9 patients while in 13 of them, the histopathological findings were similar for both forceps biopsy and pleural brush. In the remaining 4 cases, thoracoscopic pleural brush was the only key for diagnosis (Fig. 2).

Follow up for those patients with non-specific pleurisy revealed that three of them responding on antibiotics while the other one diagnosed as collagen disease and showed response to steroid. One patient of two who revealed normal pleural tissue had improved on therapeutic trial of anti-tuberculous therapy while the other one refused further investigations and lost follow up.

The procedure was generally well tolerated by the patients with no major complications recorded. Minor complications occurred in nine patients. Fever recorded in three patients improved within 1 day using antipyretic, subcutaneous emphysema in three patients improved spontaneously not needed surgical intervention, hypoxia developed in two patients managed by oxygen therapy and post procedures pain in one patient managed by analgesia (Table 5).

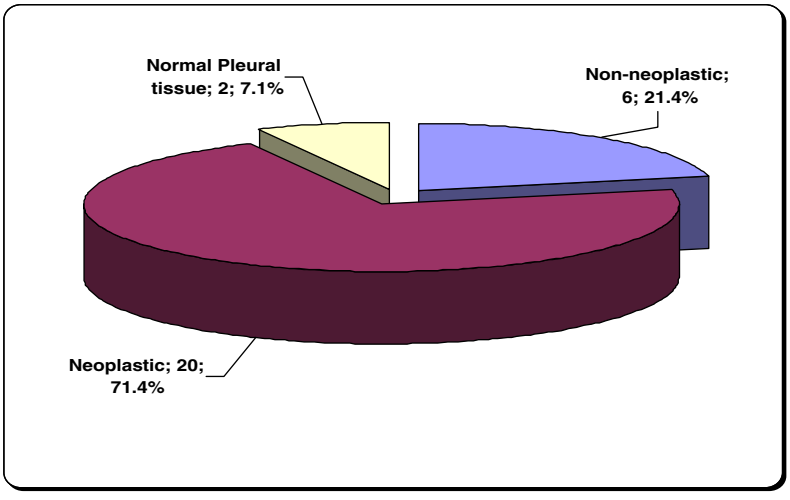

Figure 1 Histopathological results of thoracoscopic specimens among 28 patients included in this study.

Table 4 Final detailed histopathological results of the thoracoscopic pleural specimens.

Histopathological results	Number	%
Pathology detected	26	92.9
Adenocarcinoma	15	53.6
Malignant mesothelioma	3	10.8
Small cell lung cancer	1	3.6
Non-Hodgkin lymphoma	1	3.6
Tuberculosis	2	7.1
Non-specific pleuritis	4	14.2
Pathology not detected (normal pleura)	2	7.1

Table 5 Complications of medical thoracoscopy observed in 28 patients within 24 h of the procedure.

Complications	Number	%
Subcutaneous emphysema	3	10.7
Fever	3	10.7
Hypoxia	2	7.2
Pain	1	3.6

Discussion

A significant proportion of patients with pleural effusion remain undiagnosed after thoracentesis and pleural fluid analysis for biochemistry, microbiology and cytology, and a closed pleural biopsy. In this study, we have presented the data of 28 consecutive patients who underwent thoracoscopy for the diagnosis of undiagnosed pleural effusions in whom initial diagnostic work-up were inconclusive. The yield of thoracoscopic pleural biopsy was 92.9% (26/28) patients in this group. Similar experience with medical thoracoscopy has been described from other centers. Tscheikuna et al. [6] described their experience from Thailand where thoracoscopy was diagnostic in 95% of 34 patients.

Kendall et al. [7] reported yield of thoracoscopic pleural biopsy to be 83% in their study which included 48 patients. Elameen [8] and his colleague had reached a specific diagnosis in 24 patients out of 26 ones with diagnostic accuracy of 92.3%.

In this study pleural metastasis is the most common cause of malignant pleural effusions than mesothelioma as we could diagnose three cases of mesothelioma out of 20 cases proved finally to have malignant lesions. Whereas metastatic adenocarcinoma could be diagnosed in 15 patients, (12 ones due to extra-pulmonary primary and three ones due to primary pulmonary adenocarcinoma), also metastatic small cell lung cancer detected in one patient, and non-Hodgkin lymphoma in another one patient.

These findings are in concordance with the findings of Elhalfwy et al. [9] who found that 19 patients out of 30 ones hade malignancy as case of malignant pleural effusion, of those 6 had mesothelioma and 13 had malignancy metastasizing to the pleura while adenocarcinoma was the most encountered metastatic malignancy. Also Mootha et al. [10] diagnosed only one case of mesothelioma whereas 16 of the 17 malignant cases were due to pleural metastasis.

Regarding non-neoplastic results of this study there were only two patients in whom the thoracoscopic biopsy was suggestive of tuberculosis. Although tuberculous pleural effusion is common, the small number of patients diagnosed by this procedure suggests that it is diagnosed in the majority without thoracoscopy. This is may be variable as Mootha et al. [10] found that 8 out of 35 (22.9%) patients had pleural TB on thoracoscopic pleural biopsy, Elhalfwy et al. [9] could diagnose only 3 tuberculous cases out of 11 patients diagnosed by medical thoracoscope as non-neoplastic etiology for pleural effusion, while in contrast to the findings of Kendall et al. [7] who did not find any case of TB in their study of 48 patients undergoing thoracoscopy for undiagnosed pleural effusions. This variability may be explained that direct examination of pleural fluid by Ziehl–Neelsen staining detects AFB in less than 10% of the cases also mycobacterial culture of pleural fluid is time consuming and the majority of series show a diagnostic yield of less than 30% [11,12].

In our study forceps biopsy was positive in 22 out of 28 patients (78.6%) and it was the only diagnostic modality in nine

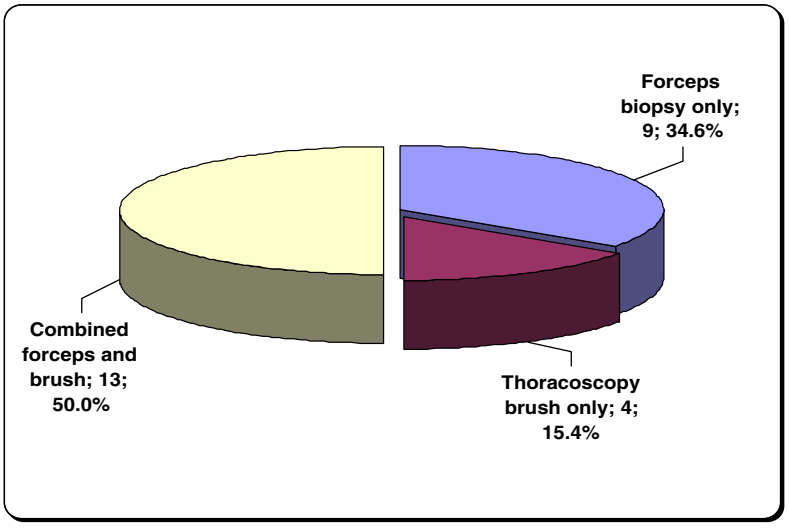

Figure 2 The positivity yield of the forceps and brush among 26 cases in whom the thoracoscopic pleural specimens showed pathology.

patients while pleural brush was positive in 17 out of 28 patients (60.7%) and it was the only diagnostic modality in four patients; in three of them bleeding occurred during biopsy forceps procedures leading to tiny specimens and the maneuver could not be completed, also in the fourth patient revealed only small nodule over the diaphragmatic pleura while many nodular lesions over the visceral pleura where biopsy forceps difficult to be done and pleural brush specimens taken safely. No complications occurred during pleural brush procedures. Also in this study the use of both forceps biopsy and pleural brush to take thoracoscopic specimens could augment the final positive thoracoscopic yield to be 92.9% instead of 78.6% (for forceps biopsy alone) or 60.7% (for pleural brush alone).

From this study we can conclude that thoracoscopic pleural brush could be done easy and safe and allow obtaining pleural cellular material in areas dangerous to take biopsy specimens. It could augment the diagnostic yield of medical thoracoscope.

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